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Specification and Drawings, as originally filed, with Application for Patent Serial No: **CA 2411365**, on December 6, 2002, by **MARIAN GAVRILA and GABRIEL PATULEA**, for "Cellular Telephone, Fixed Telephone or Personal Digital Assistant (PDA) with Multiple Built In Sensors".

Agent certificateur/Certifying Officer

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O P I C   C I P O

Abstract

Cclullar telephone, Personal Digital Assistant (PDA) or fixed telephone with multiple built
in alarm sensors capable of identifying multiple potentially dangerous events, that provides
warning to individuals or groups of people. It also transmits an alarm specific signal to a
dispatch center, providing information regarding the nature and the location of the alarm.

Celular telephone, Fixed Telephone or Personal Digital Assistant (PDA) with multiple built-in alarm sensors

BACKGROUND OF THE INVENTION

The present invention relates to a cellular/fixed telephone or a PDA and, more particularly, to a cellular/fixed telephone or PDA operating as an alarm with built in means for detecting the occurrence of a range of predetermined events and for communicating the occurrence of the events to a called telephone number, as is, but not limited to, an emergency dispatch center. The device, sends an alarm to the person carying it, as well as to the surrounding people, irrespective to the ability of the device to connect or not to the communication network.

Currently, there are many types of alarm systems which sound an audio alarm upon detection of one or more predetermined events. These alarms protect the security of homes, automobiles, businesses, etc. and often alert police or other security companies of an unlawful entrance of the premises. The present invention is not mainly focused on property protection, rather on the human being protection against various potential hazards.

Sensors capable of identifying multiple potentially dangerous events depend on the indicator substance, to measure each volatile compound and each desired gas, for example, carbon monoxide, volatile amines, ammonia, nitrogen dioxide "G-type" nerve agents, such as sarin, soman and GF. Other sensors types that could be used in the present invention are, but not limited to, radiation sensors and biosensors.

Carbon monoxide is the leading cause of poisoning deaths in the U.S. Annually 3,500 to 4,000 die. and an estimated 10,000 people lose a day's work or seek medical attention. Fires cause approximately two-thirds of known fatalities, with automobile exhaust and faulty heating equipment causing the remaining one-third.
Carbon monoxide is rapidly absorbed by the lungs and quickly passes to the blood. The affinity of CO and the red blood cells, hemoglobin, is 2;0 to 270 times greater than the affinity of oxygen and hemoglobin. Hemoglobin carrying CO (carboxyhemoglobin), is incapable of releasing oxygen to the tissues. Even small amounts of carbon monoxide in the air breathed will quickly increase the percentage of carboxyhemoglobin. For instance,

breathing air with 0.0 1 % (100 ppm)carbon monoxide for two hours has been shown to increase blood carboxyhemoglobin concentrations to 16.0%, a concentration that can cause CO poisoning symptoms
U.S. Environmental Protection Agency report !!!!The majority of households in Canada and the U.S. are potentially at risk from CO poisoning from at least one hazardous source

OBJECTS OF THE INVENTION

Therefore, it is an object of the present invention to provide a cellular/fixed telephone or PDA alarm which overcomes the shortcomings of existing alarm systems.

Another object of the present invention is to provide a cellular/fixed telephone alarm or PDA alarm that are operable to be utilized as an alarm system and which may be utilized also as a regular cellular/fixed telephone or PDA. Hence, to the cellular/fixed phone or PDA is added the personal security device functionality for potentially dangerous situations.

The device is useful for self protection or group protection in circumstances as: schools, kindergardens, (transport in comun), stadiums, trains and train stations, airports, subways, shows (sali de spectacol), malls.

A further object of the present invention is to provide a cellular/fixed telephone alarm having alarm capabilities not possible by typical alarm systems.

Various other objects, advantages and features of the present invention will become readily apparent to those of ordinary skill in the art, and the novel features will be particularly pointed out in the appended claims.

SUMMARY OF THE INVENTION

In accordance with an embodiment of the present invention, a cellular/fixed telephone or PDA is provided to operate as an alarm for individuals or groups by receiving or reading a signal from one of the many built in sensors which represents the occurrence of a predetermined event, establishing automatically the cellular/fixed telephone or PDA in an alarm mode, thereafter establishing a network connection with a predetermined telephone number, transmitting to the predetermined telephone number identification data that identifies the cellular/fixed telephone or PDA and the type of alarm(s) to the called number.

As one aspect of the present invention, a digital signal received or read from any of the sensors will determine the generation of an acoustic, visual and vibration alarm irrespective of the network availability.

As another aspect of the present invention, for the analog sensors, the internal microcontroller of the cellular/fixed phone or PDA, compares the read and digitised parameters against an internally stored safety limit. If any of the read signals goes beyond the acceptable limit , this will determine the generation of an acoustic, visual and vibration alarm irrespective of the network availability.

As another aspect of the present invention, if the cellular/fixed phone or PDA is situated within the coverage area of any cellular/fixed network, then the device will establish a connection with a predetermined telephone number, transmitting to the predetermined telephone number identification data that identifies the cellular/fixed telephone or PDA and the type of alarm(s) to the called number.

Still yet a further aspect of the present invention, a channel of communication is established with a second predetermined telephone number when the cellular/fixed telephone cannot establish a channel of communication with the first called number.

Still yet a further aspect of the present invention, if the cellular/fixed phone or PDA is turned off, the sensor reading and sensing is being kept active. Should an alarm occur to one of the built in sensors, the device automatically turns on and follows the alarm signalling procedure presented above.

BRIEF DESCRIPTION OF THE DRAWINGS

The following detailed description, given by way of example, and not intended to limit the present invention solely thereto, will best be appreciated in conjunction with the accompanying drawings, wherein like reference numerals denote like elements and parts, in which:

FIG. 1 is a block diagram of the multi sensor alarm equipped cellular/fixed telephone or PDA ;

FIG. 2a is a schematic illustration of the alarm sensors connected to the internal microcontroller, digital (ON/OFF) output sensors in an interrupt driven environment;

FIG. 2b is a flowchart of the operation of the alarm sensors connected to the internal microcontroller, digital (ON/OFF) output sensors in an interrupt driven environment;

FIG. 3a is a schematic illustration of the alarm sensors connected to the internal microcontroller, digital (ON/OFF) output alarm sensors in a polling based environment;

FIG. 3b is a flowchart of the operation of the alarm sensors connected to the internal microcontroller, digital (ON/OFF) output alarm sensors in a polling based environment;

FIG. 4a is a schematic illustration of the alarm sensors connected to the internal microcontroller, analog output alarm sensors in a polling based environment;

FIG. 4b is a flowchart of the operation of the alarm sensors connected to the internal microcontroller, analog output alarm sensors in a polling based environment;

FIG. 5 is a schematic illustration of the cellular/fixed phone including a partial view of the circuit board and the built in alarm sensors.

DETAILED DESCRIPTION OF CERTAIN PREFERRED EMBODIMENTS

Referring now to the drawings, FIG. 1 is a block diagram of a cellular/fixed telephone embodying the multi alarm sensors of the present invention (also referred to herein as "Cellular telephone or Personal Digital Assistant (PDA) with multiple built in alarm sensors").

As shown, cellular/fixed telephone 10 is comprised of a microcontroller 12, a display and keyboard module 14, a transmitting circuit with its associated microphone 16, a receiving circuit with its associated speaker 18, a diplexer circuit 20 that allows the simultaneous connection of the transmitter and the receiver at the same antenna and the antenna 22 that connects to the Network Base Station 24. The microcontroller 12 provides the means for carrying out most of the standard "phone" functions of the cellular/fixed telephone or PDA 10 utilizing the permanently stored operation program. Controller 12 further provides, in conjunction with the alarm sensor multiplexer, for the operation of the cellular/fixed telephone alarm of the present invention (to be discussed). The multiplexer 26 may or may not be an external circuit since many of the existing controllers have the capability of reading multiple alarm sensors 28 at a time.

Input keys situated on the Display and Keyboard module 14 provide the means by which a user of the cellular/fixed telephone enters numbers and other information. The transmitting circuit 16 transmits and the receiving circuit 18 receives RF signals via the antenna 22 to and from a cellular telephone Network Base Station. Since the particular construction and operation of Display and Keyboard module 14, transmitter 16, receiver 18, diplexer 20 and antenna 22, are well-known in the art, further description thereof is omitted herein, except where it is necessary for an understanding of the present invention.

As will be further mentioned, while the present invention is described as pertaining to the operation of a cellular/fixed telephone, the present invention is not limited thereto and may easily be applied to other types of mobile or fixed devices including, but not limited to, a PDA, pager, fixed telephone or fax machine, even laptop or desktop computers.

DIGITAL ALARM SENSOR READING USING INTERRUPTS

FIG. 2a is a schematic detail of the multiple built in alarm sensors 28 connected to the internal microcontroller 12 of the celular phone or PDA. It is assumed that the microcontroller 12 has the capability of simultaneously monitoring of the digital outputs from all the on board provided alarm sensors 28.

FIG. 2b is a flowchart representing the basic operating mode of the current invention while the alarm sensors are being read in an interrupt based environment.

In accordance with the present invention, the microcontroller 12 runs the program associated with the normal functions of a cellular/fixed phone or PDA. The Interrupt Sequencing Logic 30 is activated and ready to signal the microcontroller should any transition would occur on any of the multi alarm sensor's 28 output. The microcontroler 12 and its associated program are so designed that even if the cellular/fixed phone is currently turned off, a transition on the alarm sensor's dedicated input would wake up the microcontroller 12. This type of function is known in the art as interrupt on change operation. Upon receiving a signal change on any of the alarm sensor's inputs, the current program routine is interrupted and a jump to the alarm servicing routine is performed. After wake up, the microcontroller checks wether the cellular/fixed phone is turned on or off. If it is turned off, then the cellular/fixed is turned on and the alarm specific procedure is being performed.

The alarm specific procedure mainly consists of: generating an alarm sound and vibration, printing the type of alarm on the display 14, try to connect over the network to an emergency preprogrammed phone number or even an internet address, transmit the associated alarm sensor code and the cellular/fixed telephone number or IP address (if available) to the emergency dispatch.
In case of a cellular/fixed phone the operator tries to contacts the cell phone owner in order to precisely identify location and asess the situation.

DIGITAL ALARM SENSOR READING USING POLLING
FIG. 3a is a schematic detail of the multiple built in alarm sensors 28 connected to the internal microcontroller 12 of the celular phone or PDA by means of a digital multiplexer 26 that extends the input/output capabilities of the microcontroller. The microcontroller also has the capability to address the multiplexer in order to select the reading of the appropriate alarm sensor. Depending on the actual microcontroller configuration and external input/output port pins availability, the multiplexer could be omitted. In this case, the microcontroller is expected, under software control, to individually read each sensor's output trought its own input/output pins.

The internal circuitry of the microcontroller is being programmed in such a way that the microcontroller periodically receives an alarm sensor related interrupt request. Following the interrupt request, the program execution jumps to the beginning of the flowchart presented in FIG. 3b. As seen in the diagram, upon starting the alarm sensor asociated interrupt routine, the microcontroller initializes the index variable N that further identifies

the alarm sensor number. While executin the alarm sensor interrupt routine, the index variable N will be sent to the multiplexer 26 addressing bus. After addressing the multiplexer 26, the microcontroller reads the data output from the multiplexer. If the current alarm sensor (addressed by N) is detected to be activated, then an alarm procedure is being initiated. If the sensor is not activated, then the index variable is being incremented (N=N+1), tested against Nmax, where Nmax is the address of the last sensor. If N is greater than the maximum available sensor address, then the micro controller resumes the main program. If N is lower than Nmax (defined above), then the microcontroller continues to check the alarm sensor status.

If the multiplexer is not needed in a specific application, the alarm sensor reading is expected to be done through the microcontroller's own input/output pins, in a similar manner like the multiplexed case.

The alarm related periodic interrupt is active even if the cellular/fixed phone or PDA is turned off. The alarm specific procedure is identical to the one specified above.

ANALOG ALARM SENSOR READING USING POLLING

FIG. 4a is a schematic detail of the multiple built in alarm sensors 28 connected to the internal microcontroller 12 of the celular phone or PDA by means of an analog multiplexer 26 that extends the input/output capabilities of the microcontroller. As previously mentioned in the description of the "DIGITAL ALARM SENSOR READING USING POLLING" , the microcontroller has the ability to individually read each sensor through multiplexor addressing. The main difference is that the sensors as well as the multiplexer are analog. If the microcontroller 12 is provided with enough analog inputs, then the analog multiplexer might not be needed.

The periodic alarm sensor reading is similar to the previously presented at the "DIGITAL ALARM SENSOR READING USING POLLING" with the difference that the microcontroller receives analog value, instead of a digital signal. The analog value is being converted to a digital number by the internal Analog to Digital (A/D) converter internal to the microcontroller. Upon conversion, the microcontroller compares the value against an internally stored table, that reflects the accepted safety limits for each alarm sensor. If at least one of the measured value goes beyond the appropriate limit, then the alarm procedure is being initiated.

One of the possible placements of the alarm sensors 28 on the printed circuit board 30 of the cellular phone is presented in FIG.5.

Claims

We claim:

A cellular/fixed telephone or PDA having an operating mode and an alarm mode, comprising:

-a plurality of built in sensors;

-processing means of the said cellular/fixed telephone or PDA to respond to an interrupt signal generated by the said sensors whenever the said sensors detect a hazardous level;

-processing means for sequentially reading a value for each sensorsignal, comparing said value with an appropriate threshold, and initiating an alarm procedure whenever said value is higher than said threshold;

-means for switching said cellular/fixed telephone or PDA from said operating mode into alarm mode;

-means for alarming the cellular/fixed telephone or PDA owner and/or the surrounding people about the detected hazard.

-said cellular/fixed telephone or PDA being configured to switch to said alarm mode and to initiate wireless transmission with a central dispatcher whenever said sensors detect a hazardous level.

Figure 1   Block Diagram of the Multi
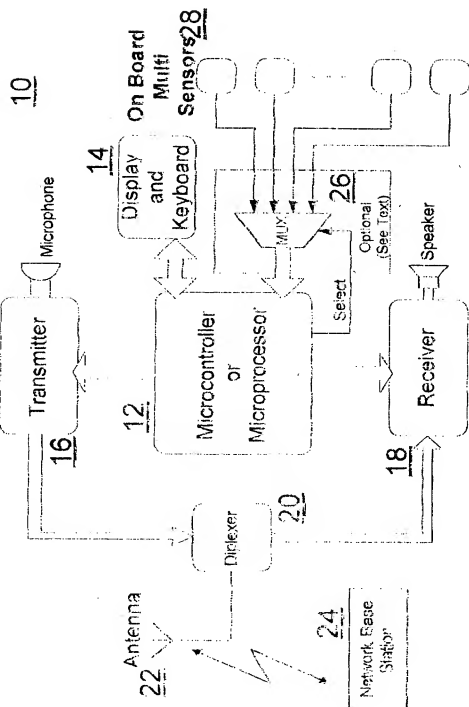   Sensor Equipped PDA, or
            Cell Phone

10

On Board
Multi
Sensors 28

14
Display
and
Keyboard

26
MUX
Optional
(See Text)

Microphone

Transmitter

12
Microcontroller
or
Microprocessor

Select

16

Receiver
Speaker

18

20
Diplexer

22
Antenna

24
Network Base
Station

Figure 2   Digital sensor reading using interrupts

a)

Cellular or PDA Internal Microcontroller — 12

30 Interrupt Sequencing Logic and I/O

Digital Output Sensors — 28

b)

Sensor(s) activated

Sensor Interrupt Received

Telephone Shut Off

Yes → Turn phone on

No

Start Alarm Procedure (See Details in Text)
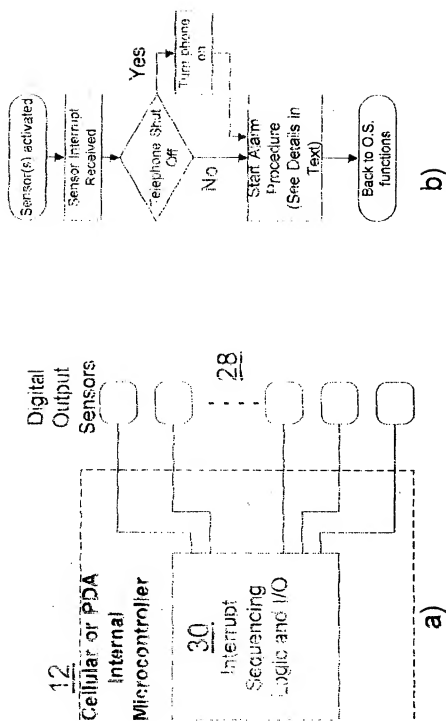
Back to O.S. functions
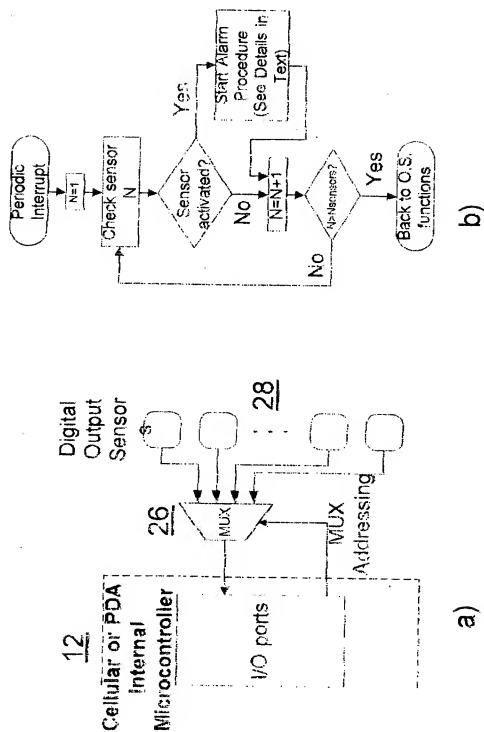
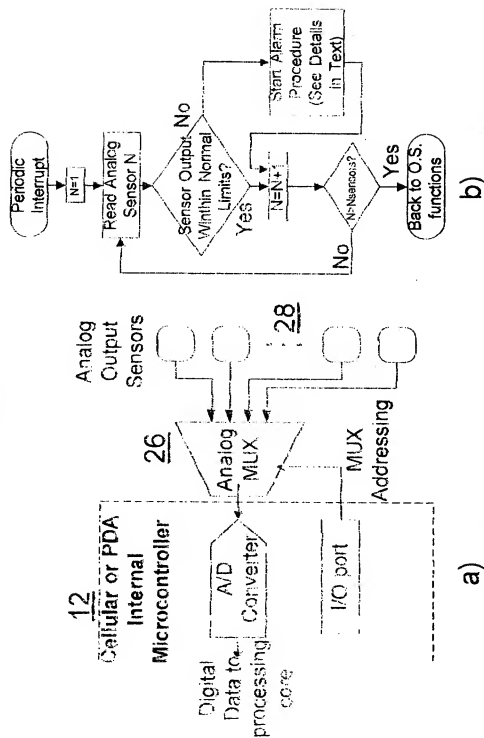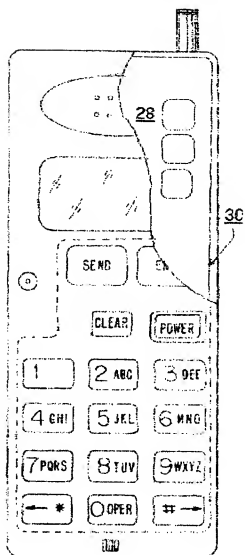Figure 3 Digital sensor reading using polling

Figure 4   Analog sensor reading
using polling

Figure 5 Cell Phone with sensors